Claims

1. An apparatus having a nanodevice for charged particles flow comprising
   - an electrolytic bath container (2), divided by a polymeric foil (3) into a first (4) and a second (5) compartment, wherein each compartment (4, 5) comprises an electrode (6, 7) connected to a direct current voltage (U_1) supply (8);
   - at least one preferentially asymmetric pore (9) forming a via hole through said foil (3), wherein said pore (9) provides
     - a narrow opening (10) of a diameter in the rage of several nanometers down to about one nanometer on a front side (11) of said foil (3) and
     - a wide opening (12) in the range of several ten nanometers up to several hundred nanometers on a back side (13) of said foil (3);
   - an electrically conductive layer (14) surrounding said narrow opening (10) on said front side (11);
   - a gate voltage (U_2) supply (15) connected to said electrically conductive layer (14) on said front side (11) of said foil (3) controlling the flow of charged particles within said nanodevice (1) from said first compartment (4) to said second compartment (5) and vice versa.

2. The apparatus according to claim 1, **characterized in that** said preferentially asymmetric pore (9) is a preferentially conical pore.

3. The apparatus according to claim 1, **characterized in that** said preferentially asymmetric pore (9) is a funnel-like

pore from said wide opening (12) toward said narrow opening (10).

4. The apparatus according to claim 1 or claim , **characterized in that** said asymmetric pore (9) is a straight trumpet-like pore from said narrow opening (10) toward said wide opening (12).

5. The apparatus according to any one of claims 1 to 4, **characterized in that** said foil (3) comprises polyethylene terephthalate.

6. The apparatus according to any one of claims 1 to 4, **characterized in that** said foil (3) comprises any polymer, preferentially polyimide.

7. The apparatus according to claim 1, **characterized in that** said foil (3) comprises polycarbonate.

8. The apparatus according to any one of claims 1 to 7, **characterized in that** said nanodevice (1) is ion selective.

9. The apparatus according to any one of claims 1 to 8, **characterized in that** said electrically conductive layer (14) surrounding said narrow opening (10) on said front side (11) comprises gold.

10. The apparatus according to any one of claims 1 to 8, **characterized in that** said electrically conductive layer (14) surrounding said narrow opening (10) on said front side (11) comprises indium oxide.

11. The apparatus according to any one of claims 1 to 10, **characterized in that** said electrically conductive layer (14) surrounding said narrow opening (10) on said front side (11) is a gate electrode (17).

12. The apparatus according to any one of claims 1 to 11, **characterized in that** said back side (13) of said foil (3) is covered by an electrically conductive layer (14) surrounding said wide opening (12).

13. The apparatus according to any one of claims 1 to 12, **characterized in that** said nanodevice (1) is applied to control or to switch on and off a charged particle flow of heavy ions, ions of macromolecules, ions of bio-molecules, ionized dimeric, ionized oligomeric or ionized polymeric DNA or ionized insulin.

14. A method for producing a nanodevice (1) of an apparatus according to one of the claims 1 to 13 comprising the steps of:
   - irradiating a membrane of a polymeric foil (3) by at least one highly accelerated ion to form an ion trace through said foil;
   - etching said ion trace;
   - drying said etched foil (3);
   - depositing an electrically conductive layer (14) on said front side (11) by diminishing the narrow opening (10);
   - reopen said narrow opening (10) to a predetermined diameter by etching said conductive layer (14) from its back side (13).

15. The method according to claim 14, wherein a single bismuth ion is accelerated to an energy in the range of 10 to 15 MeV and irradiated toward said polymeric foil (3) to form said ion trace.

16. The method according to claim 14 ore claim 15, wherein said ion trace is etched by a caustic solution.

17. The method according to claim 16, wherein said caustic solution comprises 9m NaOH.

18. The method according to one of the claims 14 to 17, wherein said ion trace is etched at room temperature.

19. The method according to one of the claims 14 to 18, wherein said deposition is carried out by sputtering a metal or a semiconductor on to said front side (11).

20. The method according to one of the claims 14 to 19, wherein said front side (11) of said foil (3) is roughened before etching said ion trace.

21. The method according to one of the claims 14 to 20, wherein said membrane is inserted in an electrolytic cell consisting of two cell halves filled with a KF solution and being divided by said membrane and sealed hermetically to etch said ion trace.

22. The method according to one of the claims 14 to 21, wherein a conductive tape is attached to the conductive layer (14) before said reopening of said narrow opening (10) is performed.

23. The method according to claim 22, wherein said foil covered on its front side (11) by a conductive tape is reentered to said electrolytic cell, which cell halves are now filled with NaF.

24. A method to control an ion flow with pores of a diameter up to hundreds of nm within a membrane, wherein said large-pore set-up the layer to represent the third electrode of an electrically conductive material, wherein the pores are not selective with respect to different ion species and wherein the potential on the conductive layer (U_2) superimposes the potential difference applied across the membrane (U_1), which for a given voltage configuration provider an enhancing or a stopping of ions.

25. The method of claim 24, wherein the membrane contains 10^7 pores/cm^2 and is made of a methylene blue dye.